Office of Operating Experience Analysis, EH-33 • U.S. Department of Energy • Washington, D.C. 20585

OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

February 5 - February 11 , 1999

Summary 99-06

Operating Experience Weekly Summary 99-06

February 5 through February 11, 1999

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EVENTS

1. VALVE MISALIGNMENT CAUSES UNCONTROLLED RELEASE

On January 28, 1999, plant engineering personnel at the Brookhaven Environmental Restoration Air Sparger/Soil Vapor Extraction System Facility incorrectly opened a bypass valve for an effluent treatment system filter unit, resulting in a release of tetrachloroethene. The release persisted for approximately 64 hours and exceeded the estimated average annual release specified in the facility's application to a state regulatory agency. Plant engineering personnel had opened the bypass valve in response to instructions from a field engineer, who had based them on inadequate procedures. This occurrence is significant because it caused an uncontrolled release of hazardous materials that exceeded a commitment to a regulatory agency. (ORPS Report CH-BH-BNL-BNL-1999-0003)

Tetrachloroethene is a volatile man-made substance widely used for dry cleaning, metal degreasing, and production of other man-made chemicals. Acute exposure to tetrachloroethene vapor can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, and possibly unconsciousness and death. Health effects from chronic low-level exposures are not known.

The effluent treatment system consists of a granular activated carbon filter unit, the purpose of which is to remove impurities from atmosphere exhausted from a soil vapor extraction process before it is released to ambient. Facility engineers had predicted from routine influent and effluent samples that the granular carbon filter unit would need to be recharged in January 1999. Accordingly, a subcontractor recharged the filter unit on January 27, 1999. On January 28, a field engineer told plant engineering personnel which valves to open to restore the system to service, incorrectly including a filter unit bypass valve. On January 29, a second plant engineering group noticed that the bypass valve was open and left the information on voice mail for the project manager, who was away from the site. They did not close the bypass valve or shut down the system. The project manager reviewed her voice mail on February 1 and immediately closed the bypass valve.

In response to this occurrence, the project manager performed calculations based on process operating records and determined that the estimated annual average for release of tetrachloroethene had probably been exceeded. Using approved dispersion models, engineers determined that the impact on the nearest downwind receptors was less than that established by state authorities. Facility personnel provided this information to the state by telephone.

During a review of this occurrence, investigators determined that the field engineer who normally would have overseen the carbon filter replacement was away from the site and that a field engineer with less direct experience with the evolution had assumed her duties. They also determined that an operations, maintenance, and monitoring (OMM) manual for the soil vapor extraction system contained a system startup procedure and that carbon filter change-out is governed by a procedure not included in the OMM manual. The field engineer used these procedures to develop her instructions; however, they contained neither adequate detail nor formal valve alignment checklists. The plant engineers who discovered the misalignment on January 29 stated that they did not know if the alignment was intentional and had called the project manager to check.

As corrective actions, facility personnel plan to improve the OMM manual and to develop appropriate valve alignment checklists. They also plan to authorize all personnel with responsibility for system operation to shut the system down if they verify or suspect that an uncontrolled release is occurring.

NFS reported a valve misalignment occurrence in Weekly Summary 98-49. In this occurrence, low air pressure in a dry pipe deluge system for a cylinder storage shed at the Savannah River Tritium Facility caused a sprinkler system to activate. The incident occurred several hours after operators had placed the system into service following a shutdown for routine testing. Investigators believe the operators who restored the system may have left an air charging valve for a deluge valve closed, allowing pressure to gradually bleed off. The control room received a low air header pressure alarm the evening before the activation. A person dispatched by the fire department could not determine the cause of the alarm and recommended that investigation be deferred until day shift personnel reported for work. At approximately 0700, a low-low air pressure alarm activated the sprinkler system. The operator who restored the system opened the air supply valve to charge the dry-pipe sprinkler headers but does not remember reclosing it. However, he does acknowledge having been involved in other activities at the time. (ORPS Report SR--WSRC-TRIT-1998-0018)

OEAF engineers reviewed the final reports for several additional valve misalignment occurrences from the ORPS database. The following are among them.

- A valve misalignment caused an unplanned tritium emission at the Richland PNNL Nuclear Facility. Following change-out of a zeolite bed designed to trap tritium gas, a task leader had directed a laboratory worker to open two specific valves inside a fume hood, one of which should not have been opened. Approximately 65 Ci of tritium gas and 3 Ci of tritiated water vapor were released. Investigators determined that the operation in progress was not specifically described in laboratory operating procedures. They also determined that the task leader, who normally performed this work, was on a temporary work restriction that prohibited him from entering the work area. (ORPS Report RL--PNNL-PNNLNUCL-1998-0011)

- Engineers at the Savannah River Heavy Water Facility discovered valve misalignments on a heavy water reconcentration process that resulted in the loss of between 3 and 7 gallons of heavy water, depending on how long the condition existed. They discovered that, contrary to requirements, an isolation valve for an on-line freezer was closed, while an isolation valve for a defrost freezer was open. Facility personnel had last swapped the on-line and defrost freezers approximately 21 days before the discovery and had performed air in-leakage tests approximately 8 days before. Valve alignment checklists for swapping freezers required independent verification, while those for recovery from in-leakage testing did not. Facility personnel have added the requirement for independent verification to the appropriate valve alignment checklists. (ORPS Report SR--WSRC-HWFAC-1998-0002)

Adherence to conduct of operations principles is crucial for efficient, effective, and safe operations. With the exception of a few mechanical failures, valve misalignment events result from breakdowns in conduct of operations. Facility managers consistently attribute direct causes of valve misalignment to inattention to detail, failure to use a procedure, using a procedure incorrectly, inadequate procedures, or problems in communication. At Brookhaven, the sense of ownership on the part of plant engineering personnel could have been stronger. One group did not question opening the bypass valve for a filter system, while another group did not pursue the resolution of an anomaly they had noticed.

These events could have been prevented by effective procedures and valve alignment checklists with independent verifications. DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, states that DOE policy is to operate DOE facilities in a manner that ensures an acceptable level of safety and to have procedures in place to control conduct of operations. Chapter I, “Operations Organization and Administration,” states that a high level of performance is achieved by establishing high operating standards, ensuring that personnel are well trained, and holding workers and their supervisors accountable for their performance. Chapter XVI,

"Operations Procedures," requires that operations procedures provide direction to ensure the facility is operated safely and within its design basis. The chapter also states that procedures should be developed for all anticipated operations and evolutions. They should provide administrative and technical direction adequate to allow users to achieve the intent of the procedures. DOE-STD 1029-92, *Writers Guide for Technical Procedures*, provides guidance to help procedure writers across the DOE complex to develop accurate, complete, and usable procedures.

Human actions are an important barrier to operating errors. DOE/EH-0502, Safety Notice 95-02, *Independent Verification and Self-Checking*, describes a technique that requires workers to (1) stop before performing the task to eliminate distractions and identify the correct component; (2) think about the task, the expected response, and actions required if that response does not occur; (3) reconfirm the correct component and perform the function; and (4) review by comparing the actual versus the expected response. Safety Notice 95-02 can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Rd., Germantown, MD 20874.

KEYWORDS: conduct of operations, independent verification, procedure, self-checking, valve

FUNCTIONAL AREAS: Conduct of Operations, Operations, Procedures

2. SHORT-CIRCUITED BATTERY TERMINAL IGNITES PACKAGING MATERIAL

On January 29, 1999, at the Rocky Flats Environment Technology Site Shipping and Receiving Warehouse, receipt inspection personnel were unpackaging 12-V acid-filled batteries when at least one battery terminal shorted out when it contacted the metal casing of another battery, causing an arc and igniting packaging material. They saw the arc and noticed that the package began smoldering, so they moved the package, with the batteries still in it, to the floor. Heat from the arc had ignited the fiberboard box the batteries were shipped in and the paper packing materials a few seconds after they were moved to the floor. Receipt inspection personnel immediately extinguished the fire and responding firefighters confirmed that the fire was extinguished. When the receipt inspection personnel opened the package, they removed some paper that was between two of the batteries. The paper allowed contact between a positively charged battery terminal and the negatively charged metal casing of another battery, resulting in a maximum 24-V electrical arc. The vendor who shipped the batteries did not properly protect the battery terminals from short circuits and did not mark or label the package as containing batteries, as required by the Department of Transportation (DOT). Failure to properly ship hazardous material resulted in a fire and could have caused personnel injury or facility damage. (ORPS Report RFO--KHLL-TRANSOPS-1999-0001)

Investigators determined that the battery manufacturer had shipped a case of the batteries to a local vendor. They determined that the manufacturer had protected the battery terminals with sleeves to prevent short circuits and had properly labeled and marked the outer package. However, local vendor personnel had repackaged the batteries because they only needed to ship a partial lot. The repackaged batteries did not include protector sleeves, only paper between the battery cases. Investigators determined that local vendor personnel included the battery material safety data sheet with the package but did not mark or label the outside of the package or prepare a compliant shipping paper. They also determined that positive means are required to prevent the battery terminals from producing short circuits and that the paper barrier was inadequate. The facility manager determined the local vendor employees should receive DOT training at Rocky Flats. He will also invite other local vendors to attend this training to prevent similar events.

OEAF engineers searched the ORPS database for similar events with a nature of occurrence code of "06" (transportation) and for all narrative containing battery OR batteries and found 18 occurrences. Following are some examples.

- On October 14, 1998, at Sandia National Laboratory, a pallet of batteries was received from a non-DOE shipper that violated DOT and United Nations requirements for marking and labeling. Investigators also determined that the batteries were stacked on pallets higher than permitted by DOT requirements. (ORPS Report ALO-KO-SNL-10000-1998-0005)

- On November 24, 1997, at the Rocky Flats Environmental Technology Site, traffic department personnel discovered, during an administrative paperwork review, that shipping papers for a forklift truck battery contained several errors in violation of DOT regulations. Warehouse personnel had shipped the battery to the vendor for recycling. Investigators determined that the battery had been properly packaged, palletized, and secured on the truck during shipment. Corrective actions included discussing with warehouse personnel the site interfaces that are needed before off-site shipments are authorized. (ORPS Report RFO--KHLL-TRANSOPS-1997-0003)

- On March 17, 1997, at the Albuquerque Field Office Transportation Safeguards System, supply department personnel received a package that violated DOT regulations. The package contained nickel-cadmium battery cells and had been sent by a non-DOE shipper. The supply manager informed the shipper that he would no longer do business with them if they shipped any more items in violation of 49 CFR. (ORPS Report ALO--ROSS-TSS-1997-0003)

Facility managers who receive shipments or ship hazardous materials should review their procedures for receipt and their shipping instructions to ensure that the procedures comply with DOE Orders and DOT regulations. In the Rocky Flats event, the fire could have been much worse had the paper shifted and allowed contact during shipment or when the batteries were unattended. In these scenarios, the fire could have spread to the material surrounding the package or the entire truck contents before anyone noticed. Receipt inspection personnel acted in a safe manner as well as quickly to extinguish the fire and prevent any damage. This is an indication of a well-trained workforce.

OEAF developed Safety Notice 95-05, *Department of Transportation Non-Compliances by Vendor Shippers.* It recommends that non-DOE shippers be given the following instructions: (1) use a DOE site-approved checklist for packaging, labeling, marking, and transporting and (2) send a copy of the shipping papers to the DOE receiving site to arrive before the shipment.

Facility managers and transportation managers should review the lessons learned in Safety Notice 95-05 and consider the following good practices: (1) give shippers the name of a specific site transportation specialist to call when questions arise, (2) check shipping papers, markings, and labels upon receipt, making sure the items received match the items listed on the papers, (3) inspect shipments upon receipt for damage or leakage, (4) inspect radioactive material shipments for external surface contamination, and (5) ensure that personnel receiving shipments have the requisite knowledge of and training in DOT requirements.

Managers in charge of receiving or transporting hazardous materials should review the following and ensure that procedures reflect the safety requirements for packaging and shipment and that employees are trained in these regulations and understand them.

- 49 CFR 172, *Hazardous Material Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements*, lists materials, including batteries, that are required to be identified as hazardous

materials for transportation purposes. The table also gives requirements for labeling and packaging.

- 49 CFR 173.159, "Batteries, wet," establishes safety requirements for packaging batteries that contain electrolyte acid or alkaline corrosive battery fluid. It states that batteries "must be completely protected so that short circuits will be prevented." It also establishes requirements for packaging batteries for transport.

- DOE O 460.1, *Packaging and Transportation Safety*, establishes safety requirements for packaging and transporting off-site shipments from DOE and for on-site transfer of hazardous materials. Hazardous material shipments are required to be in compliance with DOT hazardous materials regulations in 49 CFR 106 to 199, *Transportation*, and the applicable tribal, state, and local regulations not preempted by DOT.

- DOE O 460.2, *Departmental Materials Transportation and Packaging Management*, establishes DOE policies and requirements to supplement the applicable laws, rules, regulations, and other DOE Orders for materials transportation and packaging operations.

Safety Notices can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Rd., Germantown, MD 20874. Safety Notices are also available at http://tis.eh.doe.gov/web/oeaf/oe_analysis.html. DOT regulations are available at http://www.dot.gov/.

KEYWORDS: shipping, transportation, hazardous material, battery, fire

FUNCTIONAL AREAS: Transportation, Materials Handling/Storage

3. INCINERATOR CHAMBER ENTRY VIOLATES SAFE WORK PERMIT REQUIREMENTS

On February 4, 1999, at the Idaho National Engineering Environmental Laboratory Waste Experimental Reduction Facility, an operator violated safe work permit requirements when he entered a mixed-waste incinerator chamber to remove hardened hearth ash from an ash hopper. A shift supervisor entered the area and saw the operator inside the chamber. Because he knew that entering the chamber was outside the work scope and that no lockout or tagout had been implemented to address the physical hazards inside the chamber, he immediately ordered the operator to stop work. Although a safe work permit was in place for the work, it only permitted the operator to loosen the ash by reaching through an access hatch. However, because he had difficulty removing the ash by this method, the operator entered the chamber to facilitate ash removal. He believed that entry was permitted because an industrial hygienist had written on the safe work permit that entry was acceptable. The industrial hygienist made the note because he knew that the operator was wearing the appropriate personal protective equipment for the radiological, lead, and cadmium hazards that were present. He also believed that breaking the plane of the incinerator chamber opening with any portion of the operator's body constituted entry. Since he was new to the facility, the industrial hygienist was unaware of the physical hazards inside the incinerator. The facility manager implemented a facility stand-down for all process operations and process maintenance work until the nature of this event is understood and appropriate corrective actions are implemented. (ORPS Report ID--LITC-WERF-1999-0002)

Bottom ash is removed from the incinerator chamber after each mixed-waste incineration campaign. Ash is transferred automatically through a hopper in the bottom of the incinerator to waste drums located in the basement beneath the incinerator. The ash sometimes hardens in the

hopper, preventing automatic transfer into the drums and requiring personnel to manually break up the ash using a steel bar. Investigators determined that although this happens routinely, facility procedures do not address manual ash removal. They determined that the physical hazards inside the chamber are (1) a propane pilot light, (2) a diesel fuel burner, and (3) a shredder located at the bottom of the ash hopper. However, the shift supervisor decided that a lockout/tagout was not needed for these hazards because the job scope did not require the operator to enter the chamber. Investigators also determined that because the operator had been assigned to remove the ash after an initial pre-job brief had been held, a second pre-job brief was held in the shift supervisor's office so the operator could attend. Because the second pre-job brief was interrupted several times, the shift supervisor reported he did not stress that entry into the incinerator chamber was not permitted because of the physical hazards.

The facility manager instructed facility personnel to reevaluate how work is controlled and performed at the facility. He directed managers to personally brief all operating crews on what constitutes entry into a confined space and to discuss this event. He also directed facility personnel to (1) revise the ash drum-out procedure to include manual ash removal in the ash hopper, (2) conduct pre-job briefings in places where interruptions can be minimized, and (3) identify and include in operating procedures any additional routine work that is performed without a procedure.

NFS has reported on inadequate hazard controls in several Weekly Summaries. Some examples follow.

- Weekly Summary 98-44 reported that a detonation science and technology technician at the Los Alamos National Laboratory Firing Site received an electrical shock on his left hand while preparing to work on a laser welder chiller unit. After he was shocked, the technician replaced the cover to the chiller unit and locked it out. Investigators determined that no one had prepared a work plan or a hazards analysis for the job. (ORPS Report ALO-LA-LANL-FIRNGHELAB-1998-0008)

- Weekly Summary 98-42 reported that two workers at the Idaho Waste Experimental Reduction Facility had been exposed to airborne cadmium dust at levels that exceeded the protection factor for the respiratory protection equipment they were using. The workers were cleaning and inspecting an incinerator off-gas heat exchanger following a test burn for equipment qualification. Although facility operators had encountered cadmium dust in the heat exchanger during past cleanings, engineers did not expect the very high levels encountered during this task. The facility manager directed facility personnel to develop more effective engineering and administrative controls to mitigate cadmium hazards. (ORPS Report ID--LITC-WERF-1998-0007)

These events illustrate the importance of adequate hazard control. In the most recent event, the operator performed hazardous work when he entered the incinerator chamber without the necessary lockout/tagouts. Poor communications during the pre-job briefing contributed to this event. Also contributing to it was the fact that the industrial hygienist was relied on to perform a complete hazards evaluation and to enforce the appropriate controls to address identified hazards even though he had only recently been assigned to the facility and did not understand the mechanical hazards involved for this work activity. In addition, the operator had completed a formal qualification program and knew that the physical hazards are typically locked out before the incinerator chamber is entered, but he did not question why they were not locked out on this occasion. Had a formal procedure for this routine operation (ash removal) been in place, the

need for a lockout/tagout would have been clear. Managers should ensure that work hazards are systematically identified and incorporated into hazard analyses, work permits, procedures, and other work-planning documents. Safety management systems break down when the information is not adequate or is not effectively communicated to workers. Managers need to ensure that work permits clearly define the scope of work to be performed and any protective measures that may apply. Managers should also ensure that workers know when they reach the limit of a work permit and that they do not exceed it.

Many DOE documents provide guidance on what activities require formal work control documents, methods of performing hazards analysis, control of maintenance activities, and safety requirements. Following are just a few of the documents that facility managers should review in their efforts to ensure that formal work control documents are in place and that work activities are conducted safely and according to plan.

- DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, states that DOE policy is to operate DOE facilities in a manner that assures an acceptable level of safety and to have procedures in place to control conduct of operations.

- DOE O 4330.4B, *Maintenance Management Program*, chapter 6, "Maintenance Procedures," identifies maintenance procedures and other work-related documents needed to provide appropriate work direction and ensure that maintenance is performed safely and efficiently. Chapter 8, "Control of Maintenance Activities," states that a work control program establishes the requirements for identifying, planning, approving, and conducting maintenance activities. The Order provides a definition of maintenance management and describes the types of work that should be controlled.

- DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. This standard supports integrated safety management system principles to guide the safe accomplishment of work activities. These principles include (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibilities, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard controls tailored to work being performed; and (7) operations authorization.

- DOE-STD-1053-93, *Guideline to Good Practices for Control of Maintenance Activities at DOE Nuclear Facilities*, provides extensive guidance for the development of work control plans and the supervision of maintenance activities.

- DOE-STD-1031-92, *Guide to Good Practices for Communications*, discusses the need for clear, formal, and disciplined communications and provides guides to improve communications.

Integrated safety management information can be found at http://tis-nt.eh.doe.gov/ism. DOE technical standards are at http://www.doe.gov/html/techstds/standard/standard.html.

KEYWORDS: procedures, conduct of operations, safety, communication, work control

FUNCTIONAL AREAS: Industrial Safety, Procedures, Operations

4. OPERATIONAL SHUTDOWN FOR SAFETY CONCERNS AT ACCELERATOR COMPLEX

On February 5, 1999, at the Los Alamos National Laboratory Accelerator Complex, the Los Alamos Neutron Science Center division director and the facility manager determined that a voluntary shutdown of operations at the facility would be necessary to address potential safety concerns. The shutdown was prompted by the fact that since the beginning of calendar year 1999, the facility manager has filed five occurrence reports compared to an average of 17 or 18 reports normally generated in a calendar year. This voluntary shutdown is a positive step to ensure safety issues are properly addressed. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0006)

The division director implemented a series of management actions that included maintaining the beam delivery to experimental areas shut down and standing down the Lujan Center target cell and experiment halls. These actions were based on an evolving understanding of recent events. On February 3, 1999, a sixth incident occurred in which an employee received a mild electrical shock from a 120-V source. After this incident, the division director felt that safety concerns were no longer limited to a single experimental area, and he announced the shutdown of all programmatic work at an all-hands meeting. He also discussed the reasons for this decision and said that work would not restart until all groups had reviewed their workloads and areas and made the adjustments necessary to make the work safe. The stop work will most probably last longer than a week.

The following events reported to ORPS by the facility manager led to the stop-work action.

- Workers cleaning up following an experiment may have been exposed to beryllium dust. Experimenters were unaware that beryllium material was in the targets used in the experiment. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0001)

- Water Quality and Hydrology Group personnel determined that the free chlorine levels measured at an outfall exceeded permit limits. Free chlorine measured 6.1 mg/l, which exceeds both the daily average permitted limit of 0.20 mg/l and the daily maximum permitted limit of 0.50 mg/l. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0002)

- Technicians discovered activated water on the floor of an experiment room. A faulty pressure gauge on a service connection to a reflector water system allowed activated water to leak into the hot cell. A crack in the shielding allowed this water to flow through the shield and then deposit on the floor of the experiment room. Approximately 33 gallons of water were lost from the reflector system; a portion of this water ended up on the floor. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0003)

- Personnel and the facility became contaminated following maintenance on flow switches. Activated water leaked from a cooling water system through a flow switch that was not properly sealed and accumulated on the floor. The water registered in excess of 3 million dpm/100 cm^2. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0004)

- A technician became contaminated while performing maintenance. The highest readings were on the front pocket area of his pants (1.6 million dpm/100 cm^2 beta-gamma) and on his hands (380,000 dpm/100 cm^2 beta-gamma). The source of the contamination was the target cell cooling water. Gamma spectroscopy identified the contaminant as tungsten 181, which is in the cooling water. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0005)

- An accelerator maintenance employee received a mild electrical shock when he came in contact with an improperly grounded isolation transformer and a toolbox. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0007)

The division director for the Los Alamos Neutron Science Center will determine the criteria for a safe work environment and will decide what steps are necessary to resume work.

NFS has reported other work stand-downs and suspensions in the Weekly Summary. Some examples follow.

- Weekly Summary 98-33 reported that the division director for the Los Alamos Pajarito Laboratory ordered a stand-down of site operations following a critique of an event in which nuclear material storage mass limits were exceeded. Based on a discussion of procedures and formality of operations, he concluded that there had been a pervasive lack of formality in site operations. (ORPS Report ALO-LA-LANL-TA18-1998-0008)

- Weekly Summary 97-36 reported that the division director for Chemical Science and Technology at Los Alamos suspended operations at the Chemistry and Metallurgy Research facility because of events that occurred over several weeks. These events involved violating procedures, performing unauthorized work, and failing to invoke stop-work orders. The suspension was in effect until work control and work authorization processes were fully verified. (ORPS Report ALO-LA-LANL-CMR-1997-0016)

- Weekly Summary 96-47 reported that a facility manager at the Savannah River Central Services Works Engineering facility issued a stand-down order to a subcontractor following two events involving safety procedure violations. The order prohibited the subcontractor from performing any work on site until its personnel had been retrained on the site safety manual. Facility Evaluation Board members reported electrical safety concerns that involved an incorrect lockout/tagout and failure to use personal protective equipment near energized equipment. (ORPS Report SR--WSRC-CSWE-1996-0010)

- Weekly Summary 96-29 reported that the Laboratory Director at Los Alamos National Laboratory imposed a sitewide suspension of work until managers completed a safety review of operations. This order was issued following a series of electrical events, including one at the Accelerator Complex in which an employee was knocked unconscious from an electrical shock while working on an energized commercial microwave oven; that event resulted in a Type A investigation. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1996-0010)

These events underscore how important it is for managers to exercise their authority to suspend operations in the interest of facility and personnel safety. Being proactive and voluntarily suspending work is the proper course of action when an undesirable safety trend is identified. DOE O 440.1a, *Worker Protection Management for DOE Federal and Contractor Employees*, encourages the involvement of employees in developing program goals, objectives, and performance measures and in identifying and controlling hazards in the workplace. Procedures should be implemented that allow workers, through their supervisors, to stop work when they discover imminent danger or serious hazards.

DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. It supports integrated safety management system principles to guide the safe accomplishment of work activities. These principles include (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibilities, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard controls tailored to work being performed, and (7) operations authorization.

Integrated safety management information can be found at http://tis-nt.eh.doe.gov/ism. DOE technical standards are at http://www.doe.gov/html/techstds/standard/standard.html.

KEYWORDS: management, operations, shutdown, stop work

FUNCTIONAL AREAS: Lessons Learned, Management, Operations

5. VIOLATION OF SAFETY ANALYSIS REQUIREMENT FOR FILTER REPLACEMENT

On February 3, 1999, at the Los Alamos National Laboratory Waste Management Facility, personnel failed to replace a high-efficiency particulate air (HEPA) filter for an exhaust stack when the differential pressure across the filter exceeded the value specified in the safety analysis requirements (SAR). A facility management team member discovered that the magnehelic differential pressure gauge that detects a pressure drop across a filter (prefilter and first-stage filter) was indicating 8 inches of water (in. w.g.). This indication was pegged high (full scale) on the gauge. It was not known if there had been a pressure drop, because radiological control technicians had consistently recorded values between 6 and 8 in. w.g. in the daily gauge log since October 22, 1997. The SAR for the facility requires replacement of the filter when a pressure drop across a filter reaches 2 in. w.g. above the pressure drop recorded at the time of new filter installation. Facility personnel evaluated the stack monitoring data and concluded that there was no impact on the health and safety of personnel or the public and no impact on the environment. Failure to replace the HEPA filter at the specified pressure did, however, violate the SAR procedure. Contaminants at the facility include plutonium and americium. High differential pressure can cause filter break-through (failure), resulting in a release. (ORPS Report ALO-LA-LANL-WASTEMGT-1999-0002)

The HEPA filter and the associated magnetic differential pressure gauge for the filter system are located near the HEPA filter enclosure. Administrative procedures required personnel to read this gauge each day and log the pressure drop reading. Additionally, a supervisor was required to review the logged readings. This requirement was the result of a corrective action from an event that occurred on March 31, 1995, when a DOE facility representative discovered that radiological control technicians were recording the wrong gauge readings in the log. The technicians should have recorded the differential pressures across prefilters and HEPA filters as required by the log, but instead they recorded the incoming and exhaust airflow. The form used to log the information was not perfectly clear as to which readings were required, and it did not have a block for a supervisor's signature. Corrective actions included revising the form to make it very clear what readings are required and to include a signature block for a supervisor, who will check to ensure the form is correctly filled out and the correct readings are logged. (ORPS Report ALO-LA-LANL-WASTEMGT-1995-0003)

From February 2 through February 5, facility personnel reviewed all stack monitoring reports from December 22, 1995, through January 1, 1999, for signs of increased alpha-beta emissions into the environment. No abnormal dose readings were noted.

On February 3, facility management began an analysis of the gauge log data to establish when the violation first happened. They also discussed the relevancy of a stack consolidation project that was performed between June 1995 and the summer of 1997. They determined that new baselines for airflow were not reestablished after the completion of the project, and this was the most likely reason the gauge was pegged at 8 in. w.g. The known environmental data strengthened this opinion.

On February 4, maintenance personnel replaced the HEPA filter. The replaced HEPA filter had a buildup of particulate, causing a restriction, but there was no filter failure (break-through). A new baseline for this unit was established. After the new baseline had been established, and after filter replacement, the prefilter reading was recorded as 0.18 in. w.g. and the first-stage filter reading was recorded as 1.0 in. w.g.

On February 5, 1999, a critique was held to categorize this event. Investigators identified the following information associated with this event.

- On May 16, 1996, the Operations Manager changed the filter because the gauge reading was above 2 in. w.g. and readings made from that time until October 21, 1997, were recorded at or below 2 in. w.g.

- The gauge log data from December 1996 through September 1997 were lost because of contamination and were unrecoverable.

- On October 22, 1997, radiological control technicians recorded the prefilter and first-stage filter gauge readings at greater than 8 in. w.g. (pegged). They reported this to the person who performed the periodic checks, and no action was taken.

- The monthly periodic checks by a supervisor were no longer being performed because of changes in personnel responsibilities in the performance of this task.

- No new baseline for the test and balance traverse airflow was established following stack consolidation.

- There were no procedures to formalize the recording of the filter gauge indications and the review of the logs.

The requirement for filter change-out based on differential pressure was addressed in the safety analysis for the facility but was not formalized. The facility does not have technical safety requirements or limiting conditions for operations, and a new SAR is presently under development. Facility managers will review the safety-related status of the HEPA filter under the new SAR and formalize its surveillance, testing, and replacement.

This event identifies three shortcomings. First, the corrective action from a previous event that required a periodic review of the logs was not religiously performed after implementation, even though it might have identified the violation. Second, logkeepers continued to record gauge indications as they steadily increased over time until the gauge was pegged high. Even after they reported the pegged indications, nothing was done about it. And third, the potential impact of the stack consolidation project on the HEPA filter differential pressure was not evaluated.

DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter II, “Shift Routines and Operating Practices,” section C.4, “Round/Tour Inspection Sheets,” states that

where appropriate, equipment parameters should include maximum/minimum values of expected operating ranges to enable operators to recognize abnormal readings. Safety limits derived from Technical Specifications or Operational Safety Requirements should be highlighted. Parameters exceeding the specified maximum/minimum values should be circled or otherwise highlighted on the round sheet and promptly reported. Chapter XI, "Logkeeping," provides guidelines on establishing operating logs, recording information, ensuring legibility of entries, and performing reviews of logs. Section C.6, "Log Review," states that logs should be periodically reviewed by a supervisor.

DOE-STD-1041-93, *Guide to Good Practices for Shift Routines and Operating Practices*, section 4.1.4, states that personnel should be knowledgeable about equipment parameters. They should know where to find the parameter indicating devices, the scale of the indicating devices, and their normal values. They should understand the significance of each value recorded on the round sheet. Section 4.1.5 states that prompt action should be taken to investigate the cause of abnormal or unusual indications. Any reading given by an instrument that is pegged high should be considered unusual.

DOE-STD-1035-93, *Guide to Good Practices for Logkeeping*, provides additional guidance and direction for maintaining logs, both as working documents for the daily conduct of facility operations and as permanent legal records.

DOE/NS-0009, Safety Notice 92-4, Facility Logs and Records, provides guidance on keeping logs and records and generic recommendations for management controls that may help to ensure accurate logkeeping. Safety Notices can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Rd., Germantown, MD 20874. Safety Notices are also available at http://tis.eh.doe.gov:80/web/oeaf/lessons_learned/ons/ons.html.

KEYWORDS: differential pressure, filter, HEPA filter, operating procedures, readings, record keeping

FUNCTIONAL AREAS: Conduct of Operations, Operations, Procedures, Licensing/Compliance

FINAL REPORT

This section of the OEWS discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. SHEETROCK AND CEILING TILES FALL ONTO AN OCCUPIED CAFETERIA TABLE

On April 23, 1998, at the Oak Ridge Y-12 Site, a facility employee was struck by Sheetrock and ceiling tiles that fell 10 feet onto an occupied cafeteria table. Facility personnel isolated the area and transported the employee to site health services, where he was treated for a facial scratch and released. Facilities management personnel closed the cafeteria and initiated an investigation to determine the cause of the falling Sheetrock and tiles. They determined that steam had been leaking through a steam trap in the overhead piping, causing water to accumulate in the ceiling. The accumulated water weakened the ceiling, resulting in the falling Sheetrock and tiles. Investigators also determined that a steam trap had recently been replaced and a steam trap plug had not been properly installed. They determined that no one performed a post-maintenance test, as required by the job planning package, to ensure that repairs to the steam trap and a condensate line had stopped the steam leak and that all system components were properly installed. Therefore the direct and root cause of this event was found to be personnel error (procedure not used or used incorrectly). Although the employee was not seriously injured as a result of this event, failure to perform post-maintenance testing after the system had been repaired created a personnel safety hazard. (ORPS Report ORO--LMES-Y12SITE-1998-0018)

Investigators determined that facility personnel had prepared a job planning package to replace the steam trap and the condensate line, which were leaking water onto the floor of the cafeteria. Maintenance personnel valved out the system and locked and tagged it out, removed area insulation, and replaced the steam trap and piping on April 8 and 9. The maintenance supervisor notified utilities personnel that the repairs had been completed and then released the lockout/tagout. Utilities personnel did not valve the steam on until April 23, when someone requested heat in the cafeteria. An operator then valved the steam on, listened for leaks, and left the area. Utilities personnel were notified approximately 30 minutes later that water was coming through the ceiling into the cafeteria, so they valved the steam out and sent an operator to investigate. The operator determined that the plug was missing from the steam trap. He notified maintenance of the missing plug, ensured that the steam was valved out, and departed the area. Because no one inspected the ceiling for water damage at that time, no one cordoned off the area under it. A few hours later the cafeteria Sheetrock and ceiling tiles fell.

Investigators identified other areas where the condition of the ceiling was suspect and determined that a contributing cause for this event was equipment/material problem (defective or failed part). They determined that engineering personnel had completed an assessment of a similar incident in the facility. The assessment identified small sections of the suspended ceiling that were detached from the joists because of aging and exposure to moisture. The facility manager directed facilities maintenance personnel to repair and reinforce the entire cafeteria ceiling.

The primary lesson to be learned from this occurrence is the importance to safety of post-maintenance inspection and testing. Failure to immediately activate the steam system after repairs were completed and then perform post-maintenance testing and inspection led to this occurrence. Supervisors should not release lockouts and tagouts until operators can support and perform prescribed post-maintenance testing. Also, managers and personnel should be made aware of the hazards posed by the wetting of aging ceilings and ceiling tiles. Failure to close the cafeteria or rope off areas of the cafeteria below the affected ceiling tiles immediately after discovery of the steam leak contributed to the potential for personnel injury.

Corrective actions to be taken in response to this event are as follows:

1. Discuss lessons learned in morning toolbox sessions with the involved craftspersons. These discussions will include the following.

- Maintenance will not release equipment for return to service until operations can support post-maintenance testing.
- Visually inspect parts and equipment prior to installation.
- Supervisor and craft personnel will follow the post-maintenance testing instructions in the job package.

2. Secure the existing ceiling tiles and sheeting material in the building dining area to the support structure in order to prevent them from falling.

This event also underscores the need to maintain positive control over the status of equipment affected by maintenance or modification and the need to be alert to potential hazards. Facility managers should review the following guidance to ensure that post-maintenance testing is performed and that workers understand and follow safe work requirements.

- DOE-STD-1039-93, *Guide to Good Practices for Control of Equipment and System Status*, section 4.8, states that post-maintenance testing should verify that maintenance was performed correctly and that no problems were introduced as a result of the maintenance.

- DOE/EH-0513, Safety Notice 95-04, *Post-Maintenance Test Programs*, provides guidance and good practices for establishing effective post-maintenance test programs.

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KEYWORDS: safety hazard, personnel safety, post-maintenance testing, fall

FUNCTIONAL AREAS: Industrial Safety, Hazards and Barrier Analysis, Training and Qualification